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A Comparison of the Effects of a Linear and an Exponential Performance-Pay Function on Work Productivity

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A COMPARISON OF THE EFFECTS OF A LINEAR AND AN EXPONENTIAL PERFORMANCE-PAY FUNCTION ON WORK PRODUCTIVITY

by

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A COMPARISON OF THE EFFECTS OF A LINEAR AND AN EXPONENTIAL PERFORMANCE-PAY FUNCTION ON WORK PRODUCTIVITY

Shezeen Oah, Ph.D.

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This study examined how work productivity was affected by the way in which individual monetary incentives were related to performance. Two types of relationships, or performance-pay functions, were compared: a linear function in which a specific per piece incentive was provided for each piece completed in excess of a performance standard and an exponential function in which the amount of the per piece incentive accelerated as productivity increased. Forty college subjects were randomly assigned to one of the two pay conditions. Each subject participated in 15 forty-five minute sessions. Subjects performed a computerized work task that simulated the job of a proof operator at a bank, entering the amounts of bank checks using a keyboard. The dependent variable was the number of correctly completed checks. Productivity was comparable for subjects exposed to the linear and exponential performance-pay functions, even though subjects exposed to the exponential function earned significantly more money than the subjects exposed to the linear function. The results suggest that, within certain parameters that have yet to be determined, differences in the way in which monetary incentives are related to performance may not differentially affect performance.

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CHAPTER I

INTRODUCTION

When performance-contingent pay has been compared with hourly pay in both applied and laboratory settings, it has consistently been found to increase productivity (Bushhouse, Feeney, Dickinson, & O'Brien, 1982; Farr, 1976; Gaetani, Hoxeng, & Austin, 1985; Locke, 1982; Nash & Caroll, 1975; Orpen, 1982; Terborg & Miller, 1978; Vough, 1979; Weinstein & Holzbach, 1973). The increases in productivity have often been quite dramatic in applied settings. According to Jenkins and Gupta (1982), for instance, a number of organizations that have implemented incentive systems have benefitted by a several hundred percent increase in productivity. Vough (1979) indicated that incentive systems have resulted in a 200 percent increase in productivity over a 10-year period at IBM, and Dierks and McNally (1987) were successful in increasing productivity 200 to 300% by implementing performance-contingent pay systems at Union National Bank in Little Rock, Arkansas. Further, Locke (1982) concluded, based on a review of the experimental literature, that monetary incentives increase productivity more than other popular performance management techniques such as goal setting, employee participation, and job enrichment.

Due to the effectiveness of performance-contingent pay systems, an increasing number of organizations have implemented them in the past several years (Dolan, 1985; Murray, 1987; O'Dell, 1986; Skryzcki, 1987). However, several design and implementation problems need to be resolved before such systems can be uniformly successful. For example, several researchers and practitioners have raised the

following questions: How should the incentives be related to performance? How can fair performance standards upon which the incentives are based be developed? What is the appropriate proportion of incentives to base pay? Are incentives appropriate when workers have little control over their own performance? How frequently should incentives be provided? (Kesselman, Wood & Hagen, 1974; Kopelman, 1983; Lawler, 1971; Mihal, 1983) Although these design questions need to be answered in order to design effective incentive systems, few studies have examined these issues. The purpose of the present study was to investigate one design issue that may influence the efficacy of individual incentive systems: The way in which incentives are related to performance, the performance-pay function.

In many organizations in which individualized monetary incentives are implemented, a specific incentive amount is provided for each part that is produced or for each part that is produced above some specified performance standard. These types of fixed per piece incentive arrangements represent linear relationships between performance and pay. For illustrative purposes, assume that workers receive a guaranteed hourly wage and, in addition, $.10 for each part produced in excess of a specified standard. If workers produced 100 parts above standard, they would receive $10.00 in incentives in addition to their guaranteed hourly pay; if they produced 150 parts above standard, they would receive $15.00 in incentives. This linear relationship between performance and pay is depicted in Figure 1.

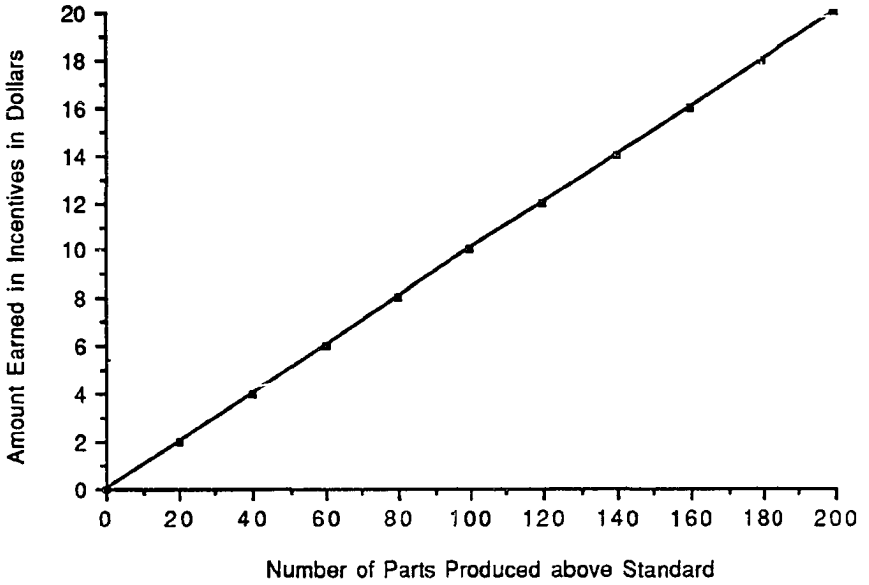


Figure 1. Linear Relationship Between Performance and Pay for a Fixed per Piece Incentive Arrangement.

Some organizations, on the other hand, have implemented incentive systems in which the per piece incentive accelerates as productivity increases: The more parts that are produced, the more each part is worth. For example, a worker may receive $.07 for the 50th part produced but $.10 for the 100th part produced. This accelerated pay arrangement results in an exponential relationship between incentives and pay. The rationale for accelerated performance-pay functions is that the more a worker produces, the more difficult it is to produce more, and therefore workers should be paid increasingly more per piece as productivity increases (K. McNally, personal communication, 1985). When compared to linear performance-pay functions, workers exposed to comparable exponential performance-pay functions earn less pay for lower levels of performance but more pay for higher levels of

performance (for an illustration, see Figure 4 which displays the performance-pay functions that were used in this study). For this reason, exponential or accelerated functions might increase productivity more quickly and sustain higher levels of productivity over time than linear functions. However, no empirical studies have compared the effectiveness of accelerated and linear performance-pay functions.

Although direct comparison data are lacking, many studies have examined a related phenomenon: the effects of increased reward magnitude on performance. A number of researchers, examining the effects of reward magnitude on the performance of nonhumans, found that when two reinforcement schedules with different reinforcement magnitudes were simultaneously available, subjects responded with higher rates on the manipulanda associated with the schedule that provided the largest reinforcer (Catania, 1963; Dunn, 1982; Fantino, Squires, Delbruck, & Peterson, 1972; Picker & Poling, 1982; Schneider, 1973). Although the responses in this situation were choice behaviors, the findings from these studies do suggest that reward magnitudes affect performance. However, investigations not involving the "choice" situation have generated inconsistent results. Some researchers (Guttman, 1953; Jensen & Fallon, 1973; Lendenman, Myers, & Fantino, 1982; Mazur, 1983; Schlinger, Blakely, & Kaczor, 1990; Shettleworth & Nevin, 1965) have reported that increases in the magnitude of reinforcement (the duration of access to reinforcement) resulted in an increased response rate, while others have reported conflicting results (e.g., Felton & Lyon, 1966; Keesey & Kling, 1961; Powell, 1969; Staddon, 1970). Similarly, although Pubols (1960), based on a review of the early research with nonhumans, concluded that increased magnitudes of rewards increase performance, Bonem and Crossman (1988), in a more recent review, indicated that changes in the magnitude of reinforcement have not always produced changes in responding.

In summary, the experimental literature conducted with nonhumans suggests that in choice situations, increases in the magnitude of reinforcement increase responding. While the results of studies of nonchoice situations are ambiguous, the nonhuman experimental literature does provide some indirect, albeit weak, support for the assumption that exponential performance-pay functions may increase performance when compared to linear performance-pay functions. However, it is not at all clear that the results of studies with nonhumans would generalize to humans as indicated by the different results obtained by studies that have examined human and nonhuman reinforcement schedule performance (Ader & Tatum, 1961; Baron & Galizio, 1983; Baron, Kaufman, & Stauber, 1969; Galizio, 1979; Harzem, Lowe, & Bagshaw, 1978; Hayes, Brownstein, Zettle, Rosenfarb, & Korn, 1986; Leander, Lippman, & Meyer, 1968; Lowe, Harzem, & Hughes, 1978; Matthews, Shimoff, Catania, & Sagvolden, 1977; Shimoff, Catania, & Matthews, 1981; Weiner, 1964, 1969).

Although most of research on reward magnitude has been conducted with nonhumans, Toppen (1965a, 1965b) conducted three studies with humans. In his first study (1965a), a 2 x 2 factorial group comparison design was used to assess the effects of reward magnitude and reward frequency on work output. During one one-hour session, college subjects received either 1 cent or 25 cents for pulling a lever an average of either 500 or 2500 times. In other words, subjects were exposed to either a variable ratio 500 or 2500 reinforcement schedule with rewards of either 1 cent or 25 cents. Results indicated that work output was significantly greater for subjects who received the 25 cent reward in comparison to subjects who received the 1 cent reward, and for subjects who were exposed to the variable ratio 500 reinforcement schedule in comparison to subjects who were exposed to the variable ratio 2500 reinforcement schedule. The results further suggested that the amount of the reward was more powerful than the frequency with which it was delivered. These data led

Toppen to conclude that "humans responding to money reward are like other animals responding to other types of reward. They show greater performance in response to greater magnitude and greater ratio of incidence of reward to units of effort expended" (p. 267).

In a second study, Toppen (1965b) examined the effects of decreased reward magnitude on lever pulling. All subjects received a monetary reward after completing an average of 1000 lever pulls. Subjects in the control group received 10 cents per reinforcement. For subjects in two groups, after a 10 cent reward had been delivered three times, the magnitude of the reinforcement was decreased abruptly to 1 cent or was gradually decreased incrementally by 1 cent per reinforcement. Subjects exposed to the decreasing monetary rewards pulled the lever significantly fewer times than control group subjects. Further, a within-subject analysis of the performance of subjects in the decreasing-reinforcement groups revealed that lever pulls decreased over time as a function of the decreases in the amount of the reward. Although the study examined decreasing amounts of monetary rewards rather than increasing amounts as would occur in an exponential performance-pay function, the results certainly suggest that human performance is sensitive to changes in the magnitude of monetary rewards. In a third more relevant study, Toppen (1965b) examined the effects of increased reward magnitude on performance. As in the preceding study, subjects received a monetary reward after completing an average of 1000 lever pulls. For one group of subjects, the amount of the reward was increased from 10 cents to 20 cents after the reinforcement had been delivered three times. For another group of subjects, after the 10 cent reward had been delivered three times, the amount of the reward was increased by 10 cents each time the reward was delivered. For this group, the magnitude of the reward was limited only by the subject's own performance: the more the subject pulled the lever, the higher the magnitude of

reinforcement. The performance of subjects who received increasing amounts of money was higher than the performance of subjects who received a fixed amount of 10 cents per reinforcement, however, the performance differences were not statistically significant at the .05 level. Taken together, the results of Toppen's studies suggest that human performance is indeed sensitive to changes in reward magnitude and, further, that increases in monetary rewards may well result in increases in performance. These data, thus, also suggest that an exponential relationship between performance and pay may increase performance more than a linear relationship.

The purpose of the present study was to directly compare the effects of an exponential and linear performance-pay function on work productivity. Unlike Toppen's studies (1965a, 1965b) in which subjects were exposed to the pay conditions for a total of only one hour, subjects in the current study participated in fifteen forty-five minute sessions in an effort to examine their performance over a relatively extended period of time. The following two questions were addressed:

1. Does an exponential performance-pay function increase productivity more quickly than linear performance-pay function?

2. Does an exponential performance-pay function sustain higher levels of productivity over time?

CHAPTER II

DESIGN AND METHODOLOGY

Subjects

Subjects were 40 male and female volunteer college students, recruited from freshmen and sophomore level psychology courses, who were paid for their participation. No screening criteria were used. Prior to participation, subjects signed an informed consent form which is included as Appendix A. The consent form, together with research protocol, was approved by Western Michigan University's Human Subject Institutional Review Board prior to the start of the study (see Appendix B for the approval letter).

Setting and Apparatus

Sessions were conducted in three small experimental rooms, each equipped with a Macintosh Plus computer and two 800K disk drives. Each subject worked in isolation. Each room had a clock and a radio, which subjects could, if they wished, listen to during the session.

Method

Experimental Design

A between-group experimental design was adopted, with twenty subjects randomly assigned to a linear performance-pay function condition and twenty

assigned to an exponential performance-pay function condition. The performance-pay functions and the work task are described in detail in subsequent sections. Each session lasted 45 minutes and each subject participated in 15 sessions.

Work Task and Dependent Variable

The work task consisted of a computerized simulation of a proof operator's job at a bank. Proof operators, using a machine that resembles a key-punch machine, encode machine-readable numbers on the bottom of checks and deposits so that these items can be processed by the bank's computers. Simultaneously the operators "proof" the accuracy of the daily transactions of the bank tellers. The work task used in this study, while not a perfect simulation of this job, simulated some of the essential components. The simulation was developed through collaboration with executives from Union National Bank in Little Rock, AR, and was developed specifically for this research.

Simulated bank checks were displayed on the computer screen. An example of a check is shown in Figure 2 on the following page. On each simulated check, a different cash value appeared. The subjects typed the cash value using the computer keyboard. As they typed the numbers, the numbers appeared in the box located at the bottom of the computer screen. After each cash value was typed, the ENTER or RETURN key had to be pressed in order for subjects to proceed. If the amount had been correctly typed, another check appeared on the screen and the procedure was repeated. If the subjects did not type the cash value correctly, a "BEEP" sounded after the RETURN or ENTER key had been pressed. The subject then had to correct the mistake and press the RETURN or ENTER key again. Once the correct cash value had been typed, and the RETURN or ENTER key pressed, another check was

presented. The dependent variable was thus the number of correctly completed checks which the computer automatically recorded.

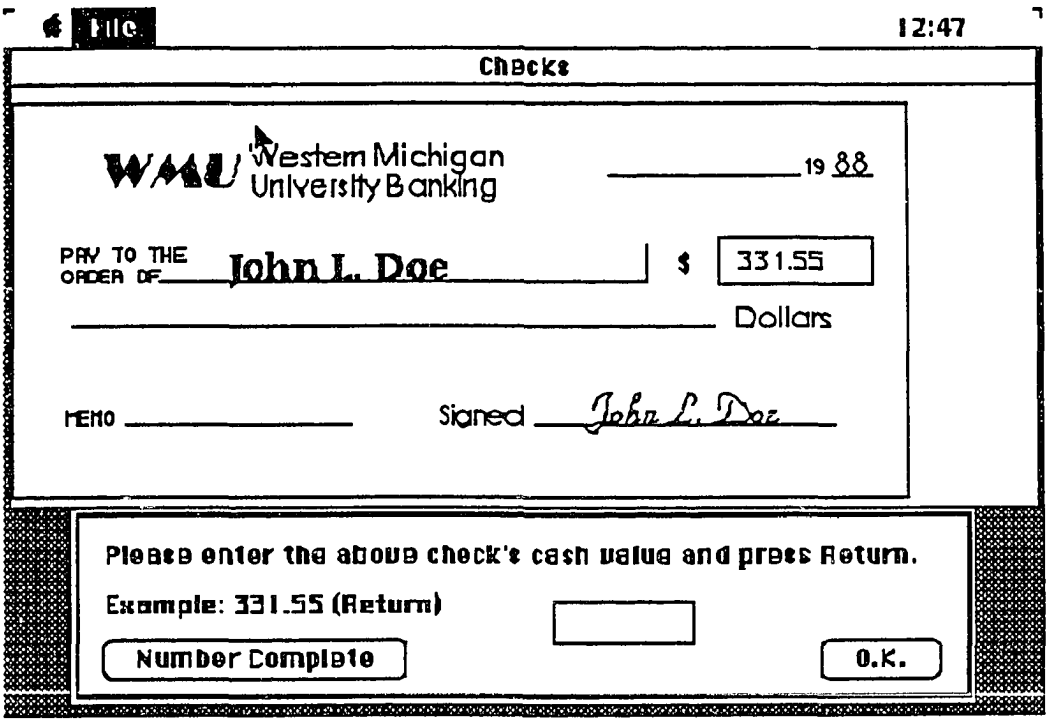


Figure 2. Simulated Check as Displayed on the Computer Screen.

Subjects could determine how many checks they had completed during the session at any time. In order to do this, subjects moved the computer "pointer" (the small arrow located at the upper left corner of the screen in Figure 2) to the box labeled NUMBER COMPLETE (see Figure 2) by using the computer "mouse" and pressing the button on the "mouse." This procedure is referred to as "pointing" and "clicking" in Macintosh computer usage manuals. After the number of completed checks was displayed, subjects "pointed" and "clicked" on the OK box in order to resume the work task (see Figure 3).

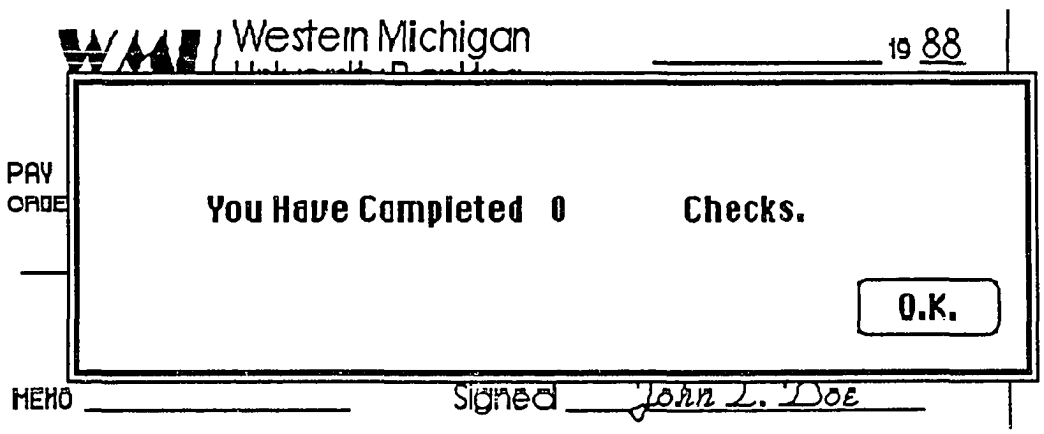


Figure 3. Screen Display When Subjects Clicked on the NUMBER COMPLETE Box.

The Independent Variables (the performance-pay functions)

Subjects in both conditions received a base pay amount and a per check incentive when performance exceeded a specified performance standard. Specifically, subjects received $2.00 for correctly completing from 1 to 490 checks and a per check incentive for each correctly completed check in excess of 490.

The performance standard of 490 was determined through pilot work. During a pilot study, five subjects were paid $3.50 (a guaranteed wage with no incentives) a session for completing the checks. Each subject participated in ten 45-minute sessions. The performance standard of 490 was one standard deviation below the mean performance of these subjects.

The independent variable consisted of the variation in the performance-pay functions. As indicated earlier, a linear performance-pay function and an exponential performance-pay function were examined. These functions are displayed in Figure 4.

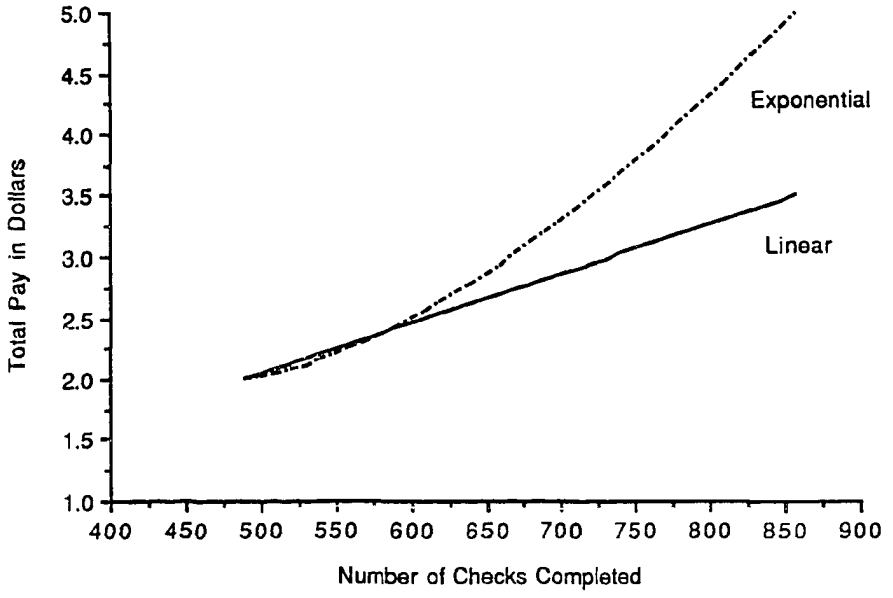


Figure 4. The Performance-Pay Functions.

Both pay functions begin at the performance standard of 490 checks and end at 860 checks. Eight hundred and sixty checks represents the number of checks that can reasonably be completed during a 45-minute session by subjects who are paid incentives. This figure was obtained from a pilot study in which five subjects were paid $.005 for each correctly completed check. Each pilot subject participated in ten forty-five minute sessions. The 860 checks represents two standard deviations above the mean performance of these pilot subjects.

The exponential performance-pay function is a 1.5 exponential function. The function was determined by a three-step process. First, the starting point (490 checks) and ending point (860 checks) of the function were determined from the pilot research that was previously described. Second, the amount of money that subjects could earn for completing 490 checks was arbitrarily selected ($2.00) as was the

maximum amount of money subjects could earn for completing 860 checks ($5.00). Third, the incentive amount for checks in between 490 and 860 was incremented by a multiplicative factor of 1.5. The resulting total amounts of money (the $2.00 base pay plus incentives) that subjects could earn per session for completing specific numbers of checks are displayed in graphic form in Figure 4 and in tabular form in Appendix C.

The linear performance-pay function was determined after the exponential performance-pay function had been determined. It is difficult to determine what linear function should be compared to the exponential function, or in other words, what the slope of the linear function should be in order to match conditions and control for the amount of money earned by subjects in the two groups. From an experimental standpoint, the slope of the linear function should be determined such that the average amount of money earned by subjects exposed to the linear function would equal the average amount of money earned by subjects exposed to the exponential function. Otherwise, observed differences in productivity could be attributed to differences in the amount of pay earned rather than to the differences in the performance-pay functions. However, the average amounts earned by subjects exposed to the performance-pay functions cannot be determined a priori because they depend upon the number of checks completed by the subjects. If it could be assumed that the performance of subjects would be equally distributed along the performance-pay functions, then the comparable linear function could be determined by making the spatial area on a graph under the linear and exponential functions equal. However, incentive payment typically increases the productivity of workers and, therefore, the productivity distribution would no doubt be skewed toward the high end of the functions. Due to the problem of identifying the linear performance-pay function that

would result in comparable earnings, the slope of linear performance-pay function was determined logically as explained in the following paragraphs.

In a work setting, prior to the implementation of an incentive system, employees are typically paid a guaranteed wage. The only performance data available to an organization prior to the implementation of an incentive system is thus average performance under this guaranteed wage system. In a real work setting, therefore, these data must be used as the basis for determining the relationship between performance and pay. Because of this, in the present study, the average performance of pilot subjects who were paid a guaranteed wage was used to determine what linear function should be compared to the exponential function: If subjects in both groups performed at the average of the pilot subjects, they would receive the same amount of money. As a result, the linear performance-pay function was designed so that it crossed the exponential function at 585 checks, which was the mean performance of pilot subjects who were paid a guaranteed wage of $3.50 for completing the checks. Thus, in the present study, if subjects in both groups completed 585 checks, they would receive the same amount of money. To determine the slope of the linear function a straight line was drawn from the 490-check starting point through the point at which subjects would earn $2.39 for completing 585 checks. The total amounts of money (the $2.00 base pay plus incentives) that subjects exposed to the linear function could earn per session for completing specific numbers of checks are displayed in graphic form in Figure 4 and in tabular form in Appendix D. The per check incentive for each check completed in excess of 490 was $.004.

As can be seen in Figure 4 or by comparing the pay tables in Appendices C and D, if the number of checks completed was below 585 (but above the 490 performance standard), subjects exposed to the linear function would earn more money than subjects exposed to the exponential function; if the number of checks

completed equaled 585, subjects exposed to the linear function would earn the same amount of money as subjects exposed to the exponential function; and if the number of checks completed was above 585 checks, subjects exposed to the linear function would earn less money than subjects exposed to the exponential function. Because 585 checks represented the mean performance of subjects who were paid a guaranteed base pay of $3.50, it was expected that the mean performance of subjects in both groups would be higher than 585 due to the monetary incentives. Thus, it was expected that subjects exposed to the exponential function would earn more money per session than subjects exposed to the linear function. If differences in performance were found, further research would have been necessary to determine whether those differences were due to the performance-pay functions or to differences in the amount of money earned by subjects by examining linear functions that would result in more comparable earnings. However, if no performance differences were observed, then one could conclude that the exponential function did not improve performance even though subjects earned considerably more money, and further research would not be necessary.

Procedure

During the initial session, the experimenter demonstrated the work task for the subjects and gave subjects both a graph and a table that displayed the relationship between the number of checks completed and the total amount of pay they would earn for completing from 1 to 860 checks. Subjects were told that they could refer to the pay graph and table at any time before, during or after a work session. Subjects were given the opportunity to try out the task and to ask any questions they may have had about the task and/or the pay system prior to the start of the first session. Subjects

were also told that they could take work breaks whenever they wanted. The actual instructions read to subjects are provided in Appendix E.

For each of the subsequent sessions, the experimenter started the session, and left the experimental room. At the end of the session, the experimenter stopped the session, plotted the number of correctly completed checks on a graph in the presence of the subject, and recorded the amount earned by the subject during that session. Subjects were paid in cash once a week.

CHAPTER III

RESULTS

Figure 5 displays the mean number of checks completed by session by subjects in the exponential and linear performance-pay conditions, and Table 1 displays the means and corresponding standard deviations by session. As can be seen from these displays, the mean number of checks completed in each session was consistently higher for the exponential than for the linear group. The differences between the means increased in the later sessions. Graphs of the performance of individual subjects can be found in Appendix F.

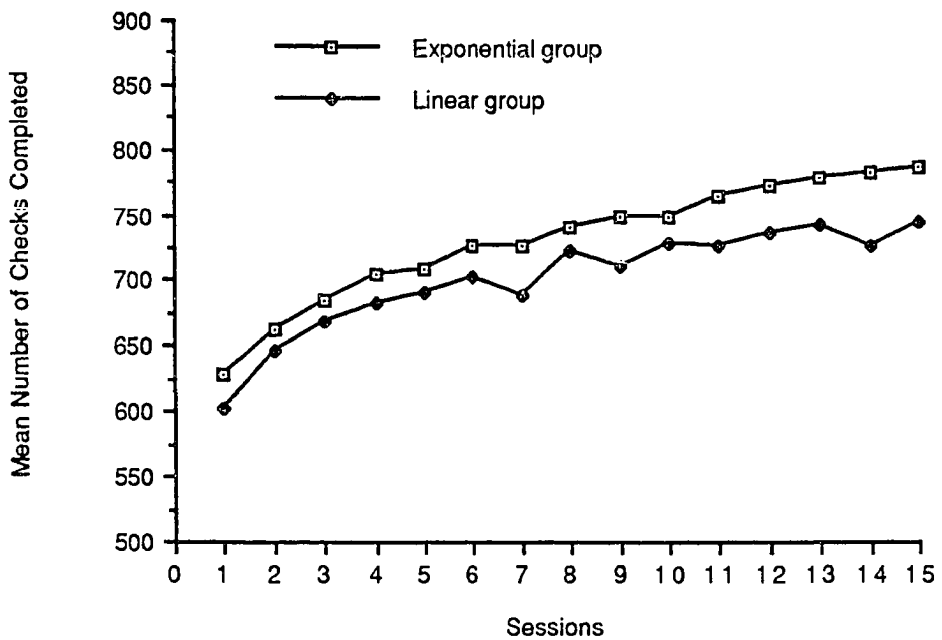


Figure 5. Mean Number of Checks Completed by Session.

Table 1

Performance Means and Standard Deviations by Session

	Exponential Condition		Linear Condition	
Session	Mean	SD	Mean	SD
1	628	97.3	602	57.8
2	663	99.2	647	61.2
3	685	97.7	668	64.8
4	706	92.0	682	65.2
5	710	91.0	690	57.5
6	727	94.6	703	62.9
7	728	89.3	689	90.8
8	742	86.0	724	62.9
9	749	84.2	711	76.0
10	750	81.7	729	63.7
11	766	86.4	727	72.2
12	773	77.7	738	68
13	779	79.7	743	62.6
14	783	81.9	727	73.6
15	787	81.2	745	67.4
Overall	732	88.0	702	67.1

In order to determine whether productivity was differentially affected by the two performance-pay functions, an ANOVA was conducted on the pooled means of the last five sessions. The analysis was conducted on the pooled means of only the

last five sessions in order to determine the effects of the two pay functions after subjects had been exposed to them for as long as possible within the constraints of the study. In order to determine the pooled means, the average number of checks completed during the last five sessions was calculated for each subject. The mean of these averages was then determined for subjects in each group, and the ANOVA was conducted on the means. The pooled performance means and standard deviations are presented in Table 2. The pooled mean for subjects in the exponential performance-pay condition was 777 with a standard deviation of 80, and the pooled mean for subjects in the linear performance-pay condition was 736 with a standard deviation of 66. As can be seen from the source table provided in Table 3, the results were not significant at the .05 level.

Table 2

Pooled Performance Means and Standard Deviations for the Number of Checks Completed in the Last Five Sessions

Group	Mean	SD
Exponential	777	80
Linear	736	66

Table 3

Source Table for the Analysis of Variance Conducted on the Pooled Means of Subject Performance During the Last Five Sessions

Source	DF	SS	MS	F
Between	1	17098.225	17098.225	3.165
Within	38	205302.750	5402.704	$p > .05$
Total	39	222400.975		

In order to determine whether the exponential performance-pay function increased productivity more quickly than the linear function, an analysis of variance was conducted on the mean slopes of the regression lines for the two groups. Regression lines were determined for each subject across the 15 sessions, and then the individual slopes were averaged within each group to obtain the mean regression slope. If productivity had increased more quickly for subjects exposed to the exponential function, the mean slopes of the regression lines would have differed. The mean slopes for the exponential group and the linear group were 10.02 and 8.09, respectively. As can be seen from the source table provided in Table 4, however, the difference between the mean slopes was not statistically significant at the .05 level ($F=3.365$, $p>.05$).

Table 4

Source Table for the Analysis of Variance Conducted on the Mean Slopes of the Regression Lines

Source	DF	SS	MS	F
Between	1	37.237	37.237	3.365
Within	38	420.545	11.067	p>.05
Total	39	457.782		

In addition to analyzing the number of checks completed, the amount of pay earned by subjects in each group was analyzed. The mean pay earned by subjects by session is displayed in Figure 6. As expected, subjects in the exponential performance-pay condition earned substantially more pay than subjects in the linear performance-pay condition. An analysis of variance conducted on the mean pay

earned by subjects for all fifteen sessions indicated that the pay differences were statistically significant at the .0001 level, as can be seen in Table 5 (F=55.36, p<.0001).

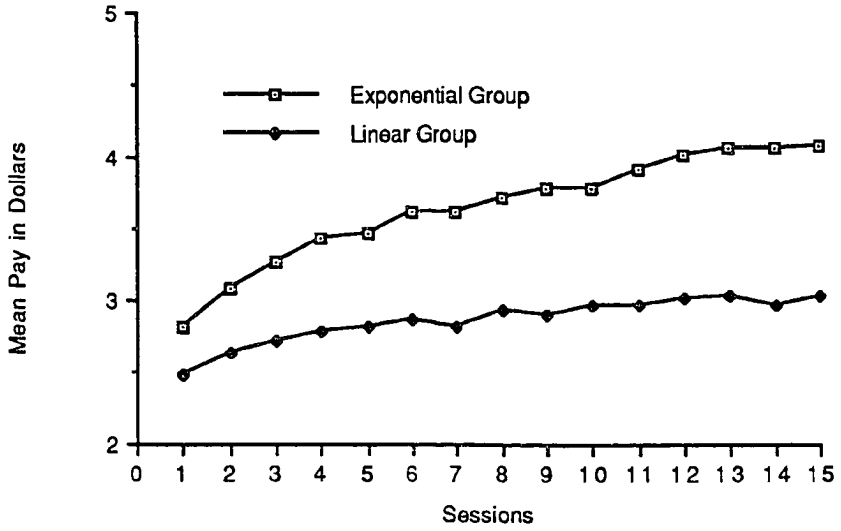


Figure 6. Amount of Pay Earned by Subjects in the Exponential and Linear Performance-Pay Conditions.

Table 5

Source Table for the Analysis of Variance Conducted on the Means of the Pay Earned by Subjects

Source	DF	SS	MS	F
Between	1	4.641	4.641	55.357
Within	28	2.348	.084	p<.0001
Total	29	6.989		

CHAPTER IV

DISCUSSION

The results of the present study revealed that the 1.5 exponential performance-pay function did not result in greater overall productivity, nor did it increase productivity more quickly than the linear function. An analysis of the average amount of money earned by subjects in the two conditions revealed, as expected, that the subjects exposed to the exponential performance-pay function earned significantly more money per session than subjects exposed to the linear performance-pay function, $3.65 and $2.86 per session, respectively. Therefore, in spite of the fact that subjects exposed to the exponential function earned significantly more money than those exposed to the linear function, their productivity was not higher nor did it improve more quickly.

It is possible that individual monetary incentives are so powerful that relatively small differences in the way in which the incentives are related to performance may not differentially affect performance. With respect to the power of individual monetary incentives, the results of numerous studies, as indicated earlier, support the effectiveness of individual monetary incentives in comparison to hourly pay (Bushhouse et al., 1982; Dierks & McNally, 1987; Farr, 1976; Gaetani et al., 1985; Jenkins & Gupta, 1982; Locke, 1982; Nash & Caroll, 1975; Orpen, 1982; Terborg & Miller, 1978; Vough, 1979; Weinstein & Holzbach, 1973). Further, the results of a recent study conducted by Frisch and Dickinson (in press) not only provide additional evidence of the power of monetary incentives but also suggest that differences in the way in which incentives are related to performance may not result in differences in

productivity. Frisch and Dickinson, in a between-group comparison, examined whether work productivity was affected by the percentage of incentives to base pay; that is, did work productivity increase as the percentage of incentives to base pay increased? Subjects earned an average of 0%, 3%, 13%, 25%, or 54% of their base pay in incentives (subjects in the 0% condition received a guaranteed wage and were not given the opportunity to earn incentives). Subjects who earned an average of only $.11 per session in incentives (3% of their $3.63 base pay) performed significantly better than subjects who received a guaranteed wage of $4.00 per session, revealing the power of monetary incentives. However, subjects who earned 3% of their base pay in incentives did not perform significantly better than the subjects who earned 13%, 25%, and 54% of their base pay in incentives, even though the subjects in the 3% condition earned considerably more money than subjects in the 13%, 25%, and 54% conditions. Similar to the present study, subjects who earned more money in incentives did not perform significantly better. Thus, within certain parameters that have yet to be determined, the amount of the incentives and the way in which they are related to performance may not differentially affect performance. If this is the case, then when individual monetary incentive systems are designed and implemented they can be tailored to meet the needs and constraints of the organization without concern that one system will be significantly less effective than other. Considerations such as cost effectiveness, simplicity, and employee acceptance and satisfaction can guide the design of such systems.

The results of the present study are consistent with the results of the study conducted by Toppen (1965b) in which he examined the effects of increased reward magnitude on performance. In his study, subjects who received increased magnitudes of monetary incentives performed consistently better than subjects who received an unvarying incentive amount, however, the results were not statistically significant. In

addition, a within-subject analysis revealed that the performance of subjects who received higher and higher incentive amounts increased as the amount of the incentive increased. Similarly, in the present study, subjects who received increasing incentive amounts due to exposure to the exponential performance-pay function performed consistently better than subjects exposed to the linear performance-pay function, and the differences increased over time although, as in Toppen's study, the differences were not statistically significant.

The results of Toppen's second study (1965b) and the present study need not be seen as conflicting with the results of Toppen's first study (1965a) in which subjects who received a 25 cent reward for pulling a lever an average of either 500 or 2500 times performed significantly better than subjects who received a 1 cent reward. First, in Toppen's later study and the present study, the performance of subjects exposed to higher incentive amounts was consistently higher than the performance of subjects exposed to lower incentive amounts. Second, Toppen's first study may, in actuality, have compared the effects of monetary incentives and a guaranteed base pay rather than the effects of different magnitudes of incentives. Toppen's subjects received a $3.50 participation fee plus a $.50 transportation fee in addition to the monetary incentives which consisted of either a 1 or 25 cent reward. It is not clear that 1 cent, provided on a variable ratio 500 or 2500 reinforcement schedule, was sufficient to affect performance. That is, a 1 cent incentive may have been comparable to no incentive and, therefore, the 1 cent incentive condition may have been equivalent to a $4.00 guaranteed base pay condition. The fact that subjects participated in only one one-hour session contributes to the possibility that their performance may have been controlled by the participation fee rather than by the 1 cent incentive. Although Toppen attempted to reduce the influence of the participation fee by having subjects participate in two fifteen-minute work periods prior to the thirty-minute experimental

session during which they earned the incentives, subject performance declined throughout the experimental session, suggesting that his procedure was not entirely successful. In fact, during the last twenty minutes of the experimental session, subjects who received 1 cent for pulling the lever an average of 500 times received an average of only 2 cents in incentives and subjects who received the 1 cent incentive for pulling the lever an average of 2500 times did not earn any incentives. Toppen (1965a) discussed the problem as follows:

> when human Ss have been paid just for coming into an experimental situation, it then is necessary to devise some means by which to convince the Ss that they have earned what they have been paid, before presenting the actual test variables. Unless this is done, one cannot assume that the test variables are the only factors influencing behavior, at least when magnitude of reinforcement in terms of further money payment is involved. Ss are otherwise inclined to feel that they are committed in some way for what they have been paid, when an amount has been given them regardless of their performance, and secondly, many are inclined to assume that they will be somehow contributing to science or helping E by a particular (larger) kind of output. It is questionable whether this kind of motivation will hold up for very long, but in the span of an hour or two in an experimental situation, the present findings indicate that these factors have a very important effect. (p. 267)

In order to determine whether there is a functional relation between the amount of incentives and performance, the effects of incentive amounts that actually increase performance must be compared. Therefore, while the results of Toppen's first study support the effectiveness of monetary incentives they may not be as relevant for ascertaining the effect of different incentive magnitudes on performance.

As noted by Balcazar, Shupert, Daniels, Mawhinney, and Hopkins (1989), analog studies, such as the present one, can contribute greatly to the field by studying phenomena "which are modeled from, but cannot be effectively or economically evaluated" in a natural work setting (p. 35). More specifically, Stoneman and Dickinson (1989) indicate that analog studies may be particularly appropriate when examining the effects of compensation systems:

> It is often impossible to acquire adequate experimental control in a natural setting, particularly in areas as sensitive as employee compensation. Few companies, and probably fewer employees, would permit pay conditions to be systematically altered in order to observe the effects on productivity. It would also be difficult to . . . randomly assign subjects to those groups without disrupting a company's normal operations. (p. 149)

However, analog studies do contain elements that may limit the generality of their results to a real work environment, and the present study is no exception.

First, subjects in this study were all volunteers and the money they earned was discretionary income. Therefore, their performance may have been less sensitive to the amount of pay they could earn or to the way in which the incentives were related to performance than the performance of nonvolunteer workers who must rely on their income to meet financial obligations.

Second, although subjects were exposed to the monetary incentive systems for a longer period of time than in previous experimental studies, the total exposure was still relatively short: 15 forty-five minute sessions. Although the performance differences were not statistically significant, subjects in the exponential group completed increasingly more checks than subjects in the linear group as the study progressed. Thus, further research with prolonged exposure to the incentive conditions, the type of exposure that would occur in a work setting, is merited.

Third, the sessions were only forty-five minutes. If incentives increase productivity primarily by increasing the amount of time employees spend working (for example, by decreasing the amount of time spent socializing and taking breaks) then the results of this study may not generalize to work situations in which employees work seven or eight hours a day. It was clear to subjects in both groups that the more checks they completed, the more money they would earn. It is not difficult to keep up a reasonable work pace for forty-five minutes, particularly when others are not present to provide distractions. Thus, although subjects were permitted

to take breaks whenever they desired, the isolated work environment, together with the short work period may have decreased the tendency for subjects to engage in the types of off-task behaviors that typically occur in a work setting. In future research, sessions could be lengthened to several hours per day in order to more accurately reflect a typical work environment.

Although the exponential function did not increase productivity more quickly or sustain higher levels of productivity in the present study, the exponential function may have some practical economic advantages when compared to a linear function. In the present study, for experimental comparative purposes, subjects exposed to both performance-pay functions began earning incentives when their performance was 1 standard deviation below the mean performance of pilot subjects who were paid a guaranteed base pay for completing the checks. Similarly, when the exponential function is implemented in actual work settings, workers typically begin to earn incentives when their performance is 1 standard deviation below the historical mean performance of employees who have been receiving a guaranteed hourly wage (W. Abernathy & K. McNally, personal communication, 1989). However, when linear functions are implemented, incentives are usually provided only for above average performance. Because of the nature of the function, the exponential function permits organizations to provide relatively low incentives for below average performance. Thus, workers who perform below average immediately begin to earn incentives and their performance may come under the control of the incentives more quickly and more economically than if a linear function were adopted. On the other hand, at high levels of performance, organizations would pay out considerably more money for comparable levels of performance if they adopted an exponential function than if they adopted a linear function. Future research should examine the economic trade-off

between these two performance-pay functions as they are typically implemented in business settings.

Finally, the type of work task used in the present study may have contributed to the lack of performance differences between the groups. To date, no study has examined how the type of task influences the size of productivity increases that occur when workers can earn monetary incentives. The task used in the present study was a relatively simple task requiring only low levels of effort. Thus, subjects exposed to both types of performance-pay functions could easily increase their performance and earn additional money. Greater performance differences may be obtained with tasks requiring more effort in both applied and experimental settings.

In summary, the results of the present study suggest that exponential performance-pay functions and linear performance-pay functions generate comparable productivity levels. Further, although productivity was similar, labor costs were considerably less for the subjects exposed to the linear function. Future research should compare the labor costs for subjects exposed to these functions as they are typically implemented in business settings; that is, when subjects exposed to the exponential function begin earning incentives when performance is 1 standard deviation below mean performance and subjects exposed to the linear function begin earning incentives when performance exceeds mean performance. In addition, replications of the present study should be conducted with larger numbers of subjects, prolonged exposure to the pay functions, longer work periods, and ideally, with employees in an actual work setting.

APPENDICES

Appendix A

Informed Consent Form

Informed Consent for Participation

Mr. She-Zeen Oah, a doctoral student in the Department of Psychology, is conducting a research study to examine how payment systems affect work productivity. Faced with declining productivity and increased foreign competition, many business organizations have recently begun to implement employee monetary incentive systems. Although monetary incentive systems have been shown to increase productivity in comparison to hourly pay, few studies have examined the best way to design such systems. Mr. Oah's study will examine the relationship between a particular type of monetary incentive system and work productivity. The study is being supported financially by Union National Bank in Little Rock, AR. This organization has implemented monetary incentive systems for almost all of their employees and is interested in determining the extent to which these systems are effective, and has asked us to help them.

If you agree to participate in this study, you will be asked to attend 15 to 20 sessions, each of which will last approximately one hour. Three sessions will be scheduled each week. They will be scheduled at times that are convenient for you. The sessions will be conducted in Wood Hall, Room 272A. During each session you will be asked to perform a work task that simulates the job of a proof operator at a bank. For the work task, bank checks written in differing amounts will be displayed on a computer screen. You will be asked to key in the amount shown on the checks using the computer keyboard. The amount of pay that you receive will depend upon the number of checks that you correctly complete. Generally, you can expect to earn from $2.00 to $4.00 per session, although the specific amount that you receive will depend upon your productivity. You will be paid weekly by check. You will be paid

on Mondays, or if you do not have a session scheduled on Monday, your first session of the week.

Your participation in this study is completely voluntary and your willingness or your lack of desire to participate will not affect your course grades. If you agree to participate, you may withdraw from the study at any time. However, if you do withdraw before completing all 15 to 20 sessions we will not be able to use your data. Therefore, please do not volunteer unless you are sure that you will be able to complete all of the sessions.

When the results of this study are publicly presented (e.g., in Mr. Oah's dissertation, in an oral presentation at a professional meeting or published in a professional journal), your performance data will be identified by number, not by your name in order to insure your anonymity. If you indicate that you would like to receive the results of the study, we will send you a final report. Due to the large number of subjects who will be participating, the final report will not be available until the spring of 1990. If you would like to participate in this research study, please sign the attached consent form and give it to the experimenter. If you have any questions regarding this research, feel free to ask the experimenter or call Mr. Oah at 387-6392 or me at 344-7914.

Dr. Alyce M. Dickinson
Assistant Professor
Department of Psychology

I would like to participate in Mr. Oah's research study that will examine the effects of pay systems on work productivity. I understand that (1) my participation is voluntary and will not affect my course grades, (2) I may withdraw from the study at any time, and (3) my performance data will remain confidential in public presentations.

Name: _____
(PLEASE PRINT)

Signature: _____ Date: _____

Appendix B

Western Michigan University's
Human Subjects Institutional Review Board Approval

WESTERN MICHIGAN UNIVERSITY

Date: July 31, 1989

To: She-Zeen Oah

From: Mary Anne Bunda, Chair Mary Anne Bunda

This letter will serve as confirmation that your research protocol, "The Effects of Linear and Accelerated Performance-pay Functions on Work Productivity in Individual Monetary Incentive Systems" has been approved by the HSIRB. The conditions and duration of this approval are specified in the Policies of Western Michigan University. You may now begin to implement the research as described in the approval application.

The Board wishes you success in the pursuit of your research goals.

xc: A. Dickinson, Psychology Department

Appendix C

Payment Schedule for the Exponential Performance-Pay Function

Payment Schedule for the Exponential Function

				PAYMENT SCHEDULE					
	Amount		Amount		Amount		Amount		Amount
# of ck		#of ck		#of ck		#of ck		#of ck	
490	2.00	530	2.11	570	2.30	610	2.55	650	2.85
491	2.00	531	2.11	571	2.30	611	2.56	651	2.86
492	2.00	532	2.11	572	2.31	612	2.57	652	2.87
493	2.00	533	2.12	573	2.32	613	2.58	653	2.88
494	2.00	534	2.12	574	2.32	614	2.58	654	2.89
495	2.00	535	2.13	575	2.33	615	2.59	655	2.89
496	2.01	536	2.13	576	2.34	616	2.60	656	2.90
497	2.01	537	2.14	577	2.34	617	2.60	657	2.91
498	2.01	538	2.14	578	2.35	618	2.61	658	2.92
499	2.01	539	2.14	579	2.35	619	2.62	659	2.93
500	2.01	540	2.15	580	2.36	620	2.62	660	2.93
501	2.02	541	2.15	581	2.37	621	2.63	661	2.94
502	2.02	542	2.16	582	2.37	622	2.64	662	2.95
503	2.02	543	2.16	583	2.38	623	2.65	663	2.96
504	2.02	544	2.17	584	2.38	624	2.65	664	2.97
505	2.02	545	2.17	585	2.39	625	2.66	665	2.98
506	2.03	546	2.18	586	2.40	626	2.67	666	2.98
507	2.03	547	2.18	587	2.40	627	2.68	667	2.99
508	2.03	548	2.19	588	2.41	628	2.68	668	3.00
509	2.04	549	2.19	589	2.42	629	2.70	669	3.01
510	2.04	550	2.20	590	2.42	630	2.70	670	3.02
511	2.04	551	2.20	591	2.43	631	2.71	671	3.03
512	2.04	552	2.21	592	2.43	632	2.71	672	3.03
513	2.05	553	2.21	593	2.44	633	2.72	673	3.04
514	2.05	554	2.22	594	2.45	634	2.73	674	3.05
515	2.05	555	2.22	595	2.45	635	2.74	675	3.06
516	2.06	556	2.23	596	2.46	636	2.75	676	3.07
517	2.06	557	2.23	597	2.47	637	2.75	677	3.08
518	2.06	558	2.24	598	2.47	638	2.76	678	3.09
519	2.07	559	2.24	599	2.48	639	2.77	679	3.10
520	2.07	560	2.25	600	2.49	640	2.77	680	3.10
521	2.07	561	2.25	601	2.49	641	2.78	681	3.11
522	2.08	562	2.26	602	2.50	642	2.79	682	3.12
523	2.08	563	2.26	603	2.51	643	2.80	683	3.13
524	2.08	564	2.27	604	2.51	644	2.81	684	3.14
525	2.09	565	2.27	605	2.52	645	2.81	685	3.15
526	2.09	566	2.28	606	2.53	646	2.82	686	3.16
527	2.09	567	2.28	607	2.53	647	2.83	687	3.17
528	2.10	568	2.29	608	2.54	648	2.84	688	3.17
529	2.10	569	2.30	609	2.55	649	2.85	689	3.18

Payment Schedule--Continued

#of ck	Amount	#of ck	Amount	#of ck	Amount	#of ck	Amount	#of ck	Amount
690	3.19	730	3.57	770	3.97	810	4.41	850	4.88
691	3.20	731	3.58	771	3.99	811	4.42	851	4.89
692	3.21	732	3.59	772	4.00	812	4.44	852	4.90
693	3.22	733	3.60	773	4.01	813	4.45	853	4.92
694	3.23	734	3.61	774	4.02	814	4.46	854	4.93
695	3.24	735	3.62	775	4.03	815	4.47	855	4.94
696	3.25	736	3.63	776	4.04	816	4.48	856	4.96
697	3.26	737	3.64	777	4.05	817	4.49	857	4.97
698	3.26	738	3.65	778	4.06	818	4.50	858	4.98
699	3.27	739	3.66	779	4.07	819	4.52	859	4.99
700	3.28	740	3.67	780	4.08	820	4.53	860	5.00
701	3.29	741	3.68	781	4.09	821	4.54		
702	3.30	742	3.69	782	4.10	822	4.55		
703	3.31	743	3.70	783	4.11	823	4.56		
704	3.32	744	3.71	784	4.12	824	4.57		
705	3.33	745	3.72	785	4.14	825	4.58		
706	3.34	746	3.73	786	4.15	826	4.60		
707	3.35	747	3.74	787	4.16	827	4.61		
708	3.36	748	3.75	788	4.17	828	4.62		
709	3.37	749	3.76	789	4.18	829	4.63		
710	3.38	750	3.77	790	4.19	830	4.64		
711	3.38	751	3.78	791	4.20	831	4.65		
712	3.39	752	3.79	792	4.21	832	4.67		
713	3.40	753	3.80	793	4.22	833	4.68		
714	3.41	754	3.81	794	4.23	834	4.69		
715	3.42	755	3.82	795	4.25	835	4.70		
716	3.43	756	3.83	796	4.26	836	4.71		
717	3.44	757	3.84	797	4.27	837	4.72		
718	3.45	758	3.85	798	4.28	838	4.74		
719	3.46	759	3.86	799	4.29	839	4.75		
720	3.47	760	3.87	800	4.30	840	4.76		
721	3.48	761	3.88	801	4.31	841	4.77		
722	3.49	762	3.89	802	4.32	842	4.78		
723	3.50	763	3.90	803	4.33	843	4.80		
724	3.51	764	3.91	804	4.35	844	4.81		
725	3.52	765	3.92	805	4.36	845	4.82		
726	3.53	766	3.93	806	4.37	846	4.83		
727	3.54	767	3.94	807	4.38	847	4.84		
728	3.55	768	3.95	808	4.39	848	4.86		
729	3.56	769	3.96	809	4.40	849	4.87		

Appendix D

Payment Schedule for the Linear
Performance-Pay Function

Payment Schedule for the Linear Function

PAYMENT SCHEDULE									
	Amount		Amount		Amount		Amount		Amount
# of ck		#of ck		#of ck		#of ck		#of ck	
490	2.00	530	2.16	570	2.32	610	2.49	650	2.65
491	2.00	531	2.17	571	2.33	611	2.49	651	2.65
492	2.01	532	2.17	572	2.33	612	2.50	652	2.66
493	2.01	533	2.17	573	2.34	613	2.50	653	2.66
494	2.02	534	2.18	574	2.34	614	2.50	654	2.66
495	2.02	535	2.18	575	2.34	615	2.51	655	2.67
496	2.02	536	2.19	576	2.35	616	2.51	656	2.67
497	2.03	537	2.19	577	2.35	617	2.51	657	2.68
498	2.03	538	2.19	578	2.36	618	2.52	658	2.68
499	2.04	539	2.20	579	2.36	619	2.52	659	2.69
500	2.04	540	2.20	580	2.36	620	2.53	660	2.69
501	2.04	541	2.21	581	2.37	621	2.53	661	2.70
502	2.05	542	2.21	582	2.37	622	2.54	662	2.70
503	2.05	543	2.21	583	2.38	623	2.54	663	2.70
504	2.06	544	2.22	584	2.38	624	2.54	664	2.71
505	2.06	545	2.22	585	2.39	625	2.55	665	2.71
506	2.06	546	2.23	586	2.39	626	2.55	666	2.71
507	2.07	547	2.23	587	2.39	627	2.56	667	2.72
508	2.07	548	2.24	588	2.40	628	2.56	668	2.72
509	2.08	549	2.24	589	2.40	629	2.56	669	2.73
510	2.08	550	2.24	590	2.41	630	2.57	670	2.73
511	2.09	551	2.25	591	2.41	631	2.57	671	2.73
512	2.09	552	2.25	592	2.41	632	2.58	672	2.74
513	2.09	553	2.26	593	2.42	633	2.58	673	2.74
514	2.10	554	2.26	594	2.42	634	2.58	674	2.75
515	2.10	555	2.26	595	2.43	635	2.59	675	2.75
516	2.11	556	2.27	596	2.43	636	2.59	676	2.75
517	2.11	557	2.27	597	2.43	637	2.60	677	2.76
518	2.11	558	2.28	598	2.44	638	2.60	678	2.76
519	2.18	559	2.28	599	2.44	639	2.60	679	2.77
520	2.12	560	2.28	600	2.45	640	2.61	680	2.77
521	2.13	561	2.29	601	2.45	641	2.61	681	2.77
522	2.13	562	2.29	602	2.45	642	2.62	682	2.78
523	2.13	563	2.30	603	2.46	643	2.62	683	2.78
524	2.14	564	2.30	604	2.46	644	2.62	684	2.79
525	2.14	565	2.30	605	2.47	645	2.63	685	2.79
526	2.15	566	2.31	606	2.47	646	2.63	686	2.79
527	2.15	567	2.31	607	2.47	647	2.67	687	2.80
528	2.15	568	2.32	608	2.48	648	2.64	688	2.80
529	2.16	569	2.32	609	2.48	649	2.64	689	2.81

Payment Schedule--Continued

#of ck	Amount	#of ck	Amount	#of ck	Amount	#of ck	Amount	#of ck	Amount
690	2.81	730	2.97	770	3.14	810	3.30	850	3.46
691	2.81	731	2.98	771	3.14	811	3.30	851	3.46
692	2.82	732	2.98	772	3.14	812	3.31	852	3.47
693	2.82	733	2.99	773	3.15	813	3.31	853	3.47
694	2.83	734	2.99	774	3.15	814	3.31	854	3.48
695	2.83	735	2.99	775	3.16	815	3.32	855	3.48
696	2.84	736	3.00	776	3.16	816	3.32	856	3.48
697	2.84	737	3.00	777	3.16	817	3.33	857	3.49
698	2.84	738	3.01	778	3.17	818	3.33	858	3.49
699	2.85	739	3.01	779	3.17	819	3.33	859	3.50
700	2.85	740	3.01	780	3.18	820	3.34	860	3.50
701	2.86	741	3.02	781	3.18	821	3.34		
702	2.86	742	3.02	782	3.18	822	3.35		
703	2.86	743	3.03	783	3.19	823	3.35		
704	2.87	744	3.03	784	3.19	824	3.35		
705	2.87	745	3.03	785	3.20	825	3.36		
706	2.88	746	3.04	786	3.20	826	3.36		
707	2.88	747	3.04	787	3.20	827	3.37		
708	2.88	748	3.05	788	3.21	828	3.37		
709	2.89	749	3.05	789	3.21	829	3.37		
710	2.89	750	3.05	790	3.22	830	3.38		
711	2.90	751	3.06	791	3.22	831	3.38		
712	2.90	752	3.06	792	3.22	832	3.39		
713	2.90	753	3.07	793	3.23	833	3.39		
714	2.91	754	3.07	794	3.23	834	3.39		
715	2.91	755	3.07	795	3.27	835	3.40		
716	2.92	756	3.08	796	3.24	836	3.40		
717	2.92	757	3.08	797	3.24	837	3.41		
718	2.92	758	3.09	798	3.25	838	3.41		
719	2.93	759	3.09	799	3.25	839	3.41		
720	2.93	760	3.09	800	3.26	840	3.42		
721	2.94	761	3.10	801	3.26	841	3.42		
722	2.94	762	3.10	802	3.26	842	3.43		
723	2.94	763	3.11	803	3.27	843	3.43		
724	2.95	764	3.11	804	3.27	844	3.44		
725	2.95	765	3.11	805	3.28	845	3.44		
726	2.96	766	3.12	806	3.28	846	3.44		
727	2.96	767	3.12	807	3.29	847	3.45		
728	2.96	768	3.13	808	3.29	848	3.45		
729	2.97	769	3.13	809	3.29	849	3.46		

Appendix E

Instructions to Subjects

The purpose of this research project is to study the effects of payment systems. During each session I will ask you to type numbers using the computer keyboard. The sessions will be timed and will last for 45 minutes. The computer will automatically stop you when the time is up. During each session what you have to do is to type the check's cash value in the blank box below the check. The numbers you type must be the same as the number on the check. You can use either the main keyboard or the numeric keypad. And you have to press the RETURN key or ENTER key when you complete each check. Then you will see another cash value on the check and the procedure will be repeated.

If you do not type the cash value correctly, the computer produces a "BEEP" sound after the RETURN or ENTER key has been pressed. Then you will have to type the correct cash value and press the RETURN or ENTER key again. Once the correct cash value has been typed, and the RETURN or ENTER KEY pressed, another check will be presented. Then, you can continue. If you find a mistake before pressing the RETURN or ENTER key, you can correct the mistake using the BACKSPACE key. Do you have any questions?

You don't have to type the decimal point between numbers. For example, when the cash value on the check is 234.53, you don't have to type the point between 4 and 5. Simply type 23453.

If you are interested in how many checks you have completed, you have to move the computer "pointer" (a small arrow on the screen) to the "Number Complete" box and click on it using the computer "mouse". The computer will show you the number of checks completed. In order to go back to work, you have to click "OK" box. Please don't touch anything else. That might cause system error.

If, during the session, you wish to take a break or to go to the restroom, you may leave your work station whenever you want to. Smoking is only allowed in the entry way of Wood Hall. You can also turn on the radio if you wish.

After each session completed, I will record and graph the number of checks completed. You may look at this graph at any time before and/or after each session. Attached to this graph will be a "Payment Schedule" that will let you know how much you will be paid for the number of checks you completed. You may also look at this payment schedule at any time before and/or after each session. At the end of each session, I will tell you how much you have earned. You will be paid weekly in cash each Monday or the first day of the week that you attend a session. At that time, you will be asked to sign a receipt form that we need for accounting purposes. Before we start, I would like you to practice for 5 minutes.

We are now ready to get you started. If you have any problems or questions I will be right outside this room. When the 45 minutes are up (when the check disappears from the computer screen), notify me that the session is over. Then I will see how many checks you completed and determine the amount of money you earned.

For subjects in the accelerated pay condition

You will be paid a base wage of $2.00 per session for correctly completing from 1 to 490 checks. When you complete more than 490 checks, you will earn additional money per each check completed above 490 checks. However, the payment schedule is arranged so that the more checks you complete, the more each completed check is worth. For example, if you increase the number of completed checks from 500 to 600, your earnings increase from $2.01 to $2.49 ($.48 increment). But, if you increase the number of completed checks from 760 to 860,

your earnings increase from $3.87 to $5.00 ($1.13 increment). Therefore, the more checks you complete, the more you can earn per check.

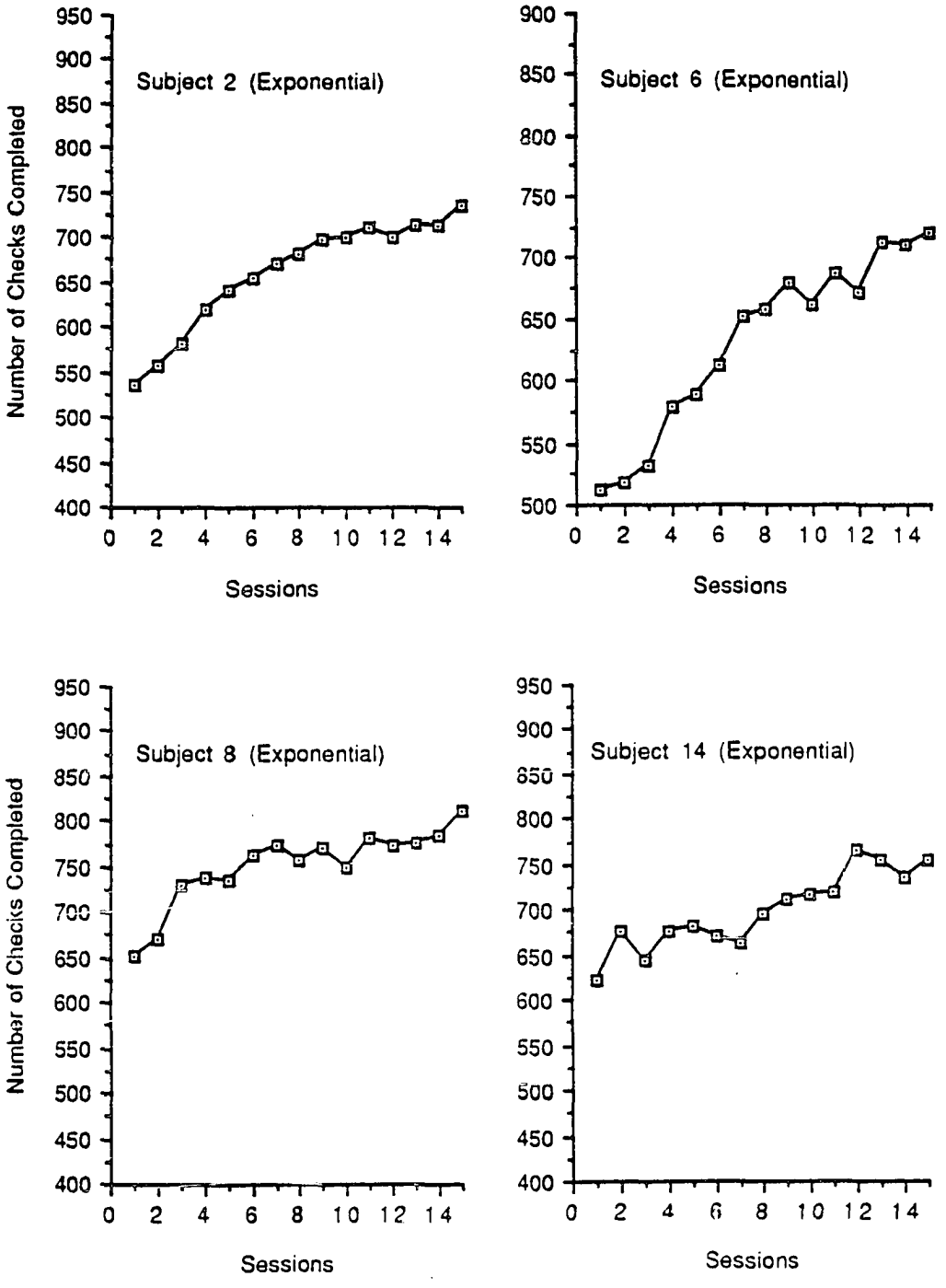
For subjects in the linear pay condition

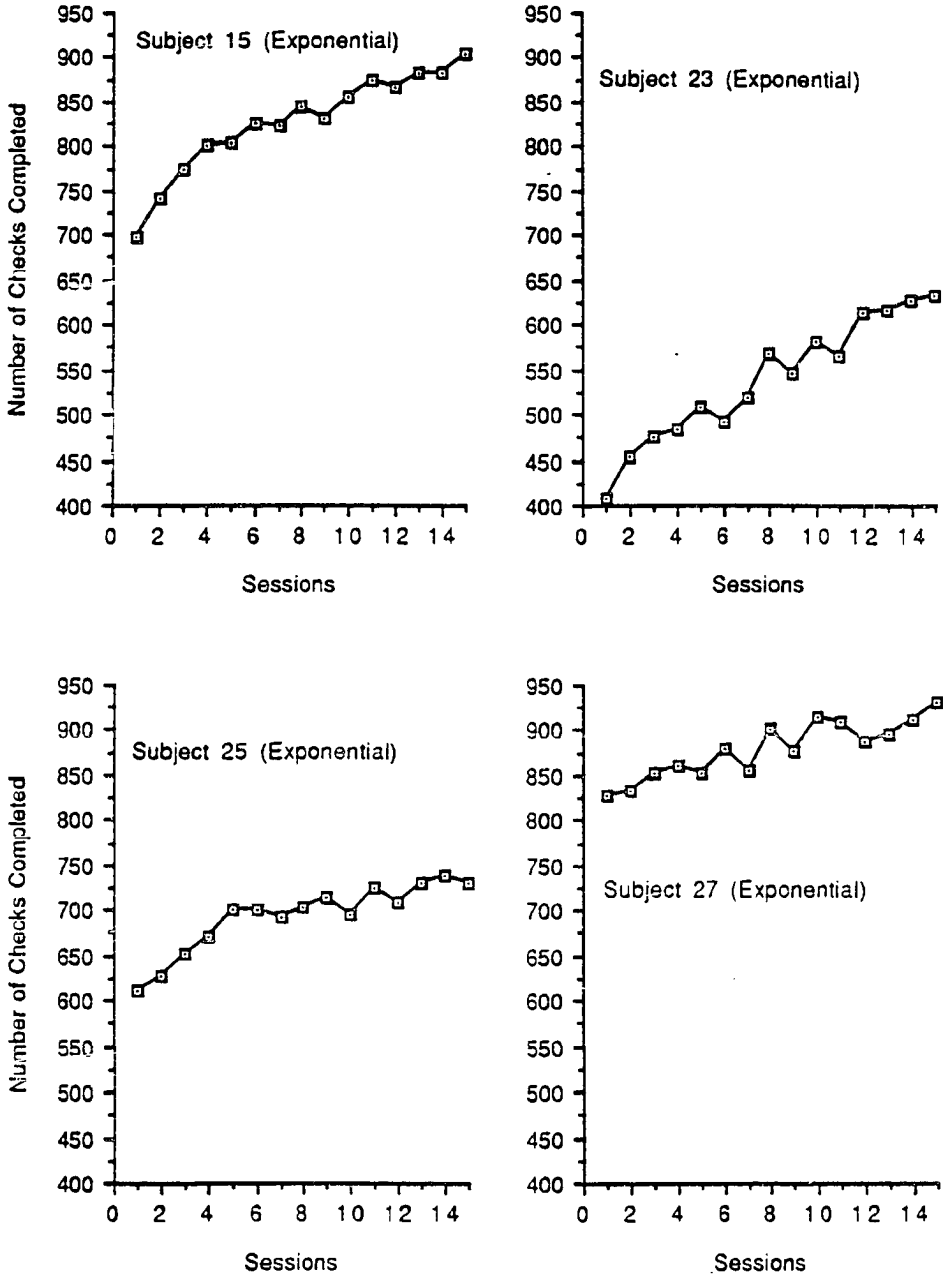
You will be paid a base wage of $2.00 per session for correctly completing from 1 to 490 checks. For each check completed above 490, you will earn approximately $0.004 per check, or in other words, 0.4 cents per check. So the more checks you complete during the session, the more money you will make.

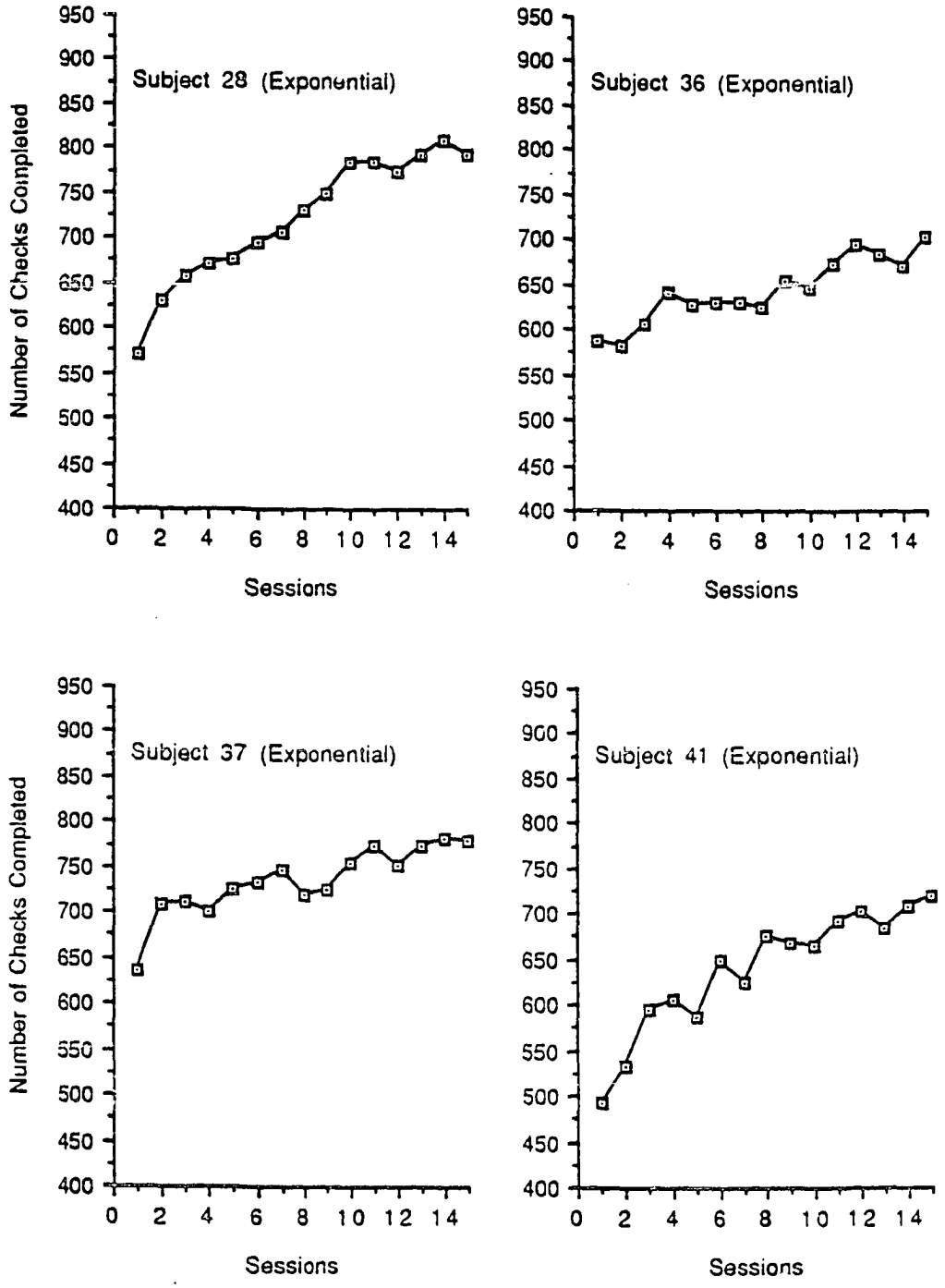
Do you have any questions before you get started? Are you ready? Now you can start.

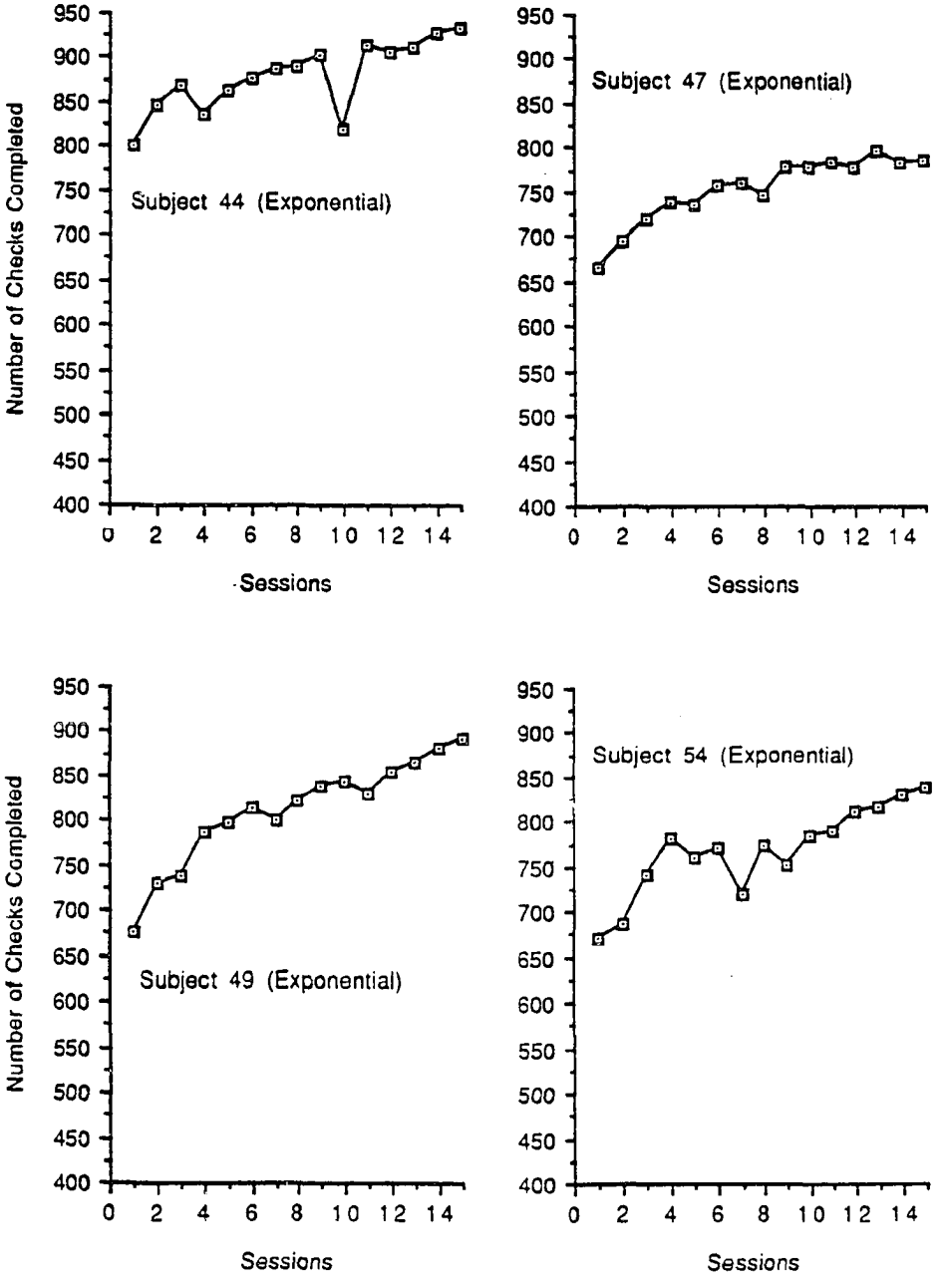
Appendix F

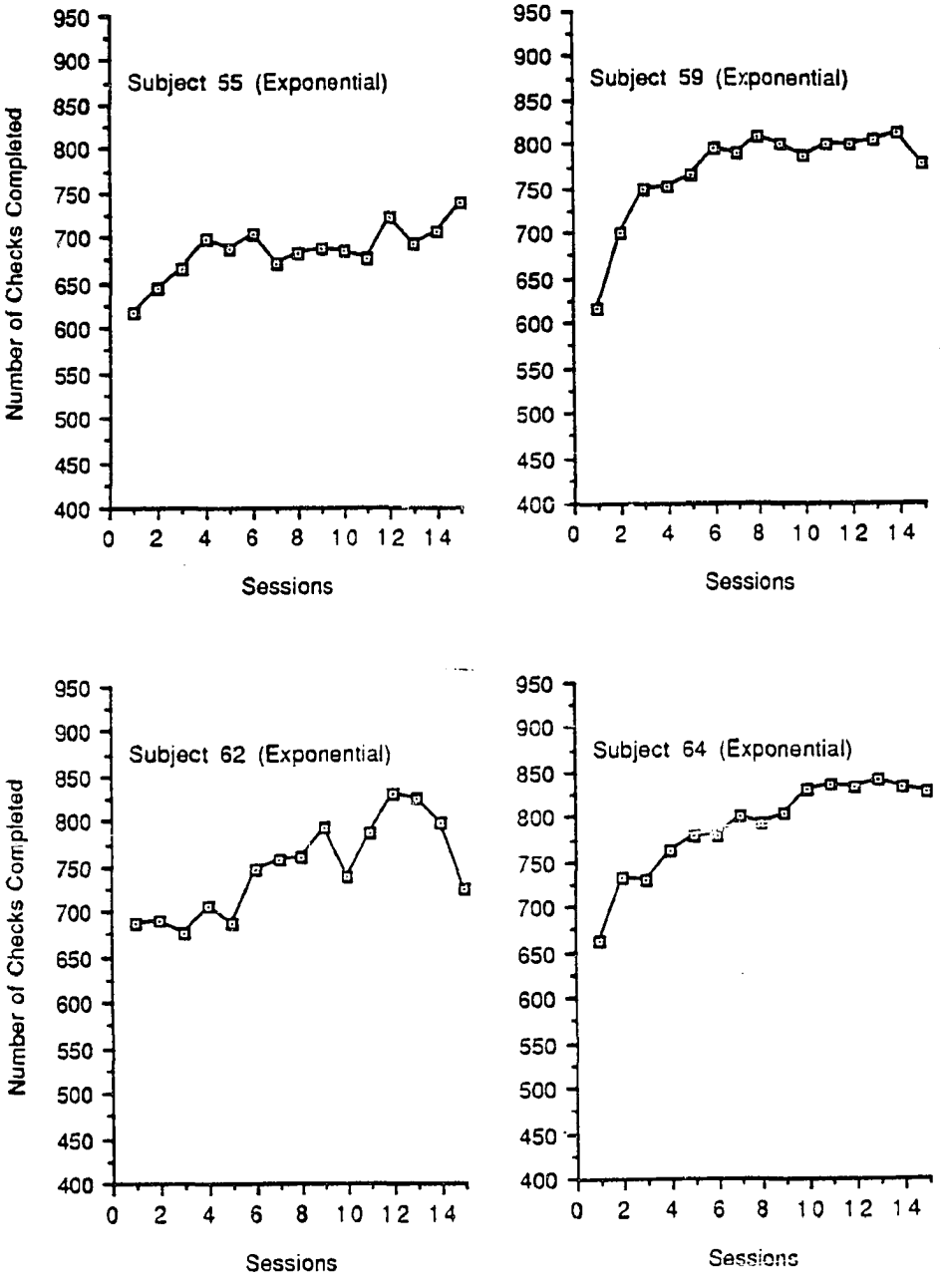
Graphs of the Performance of Individual Subjects

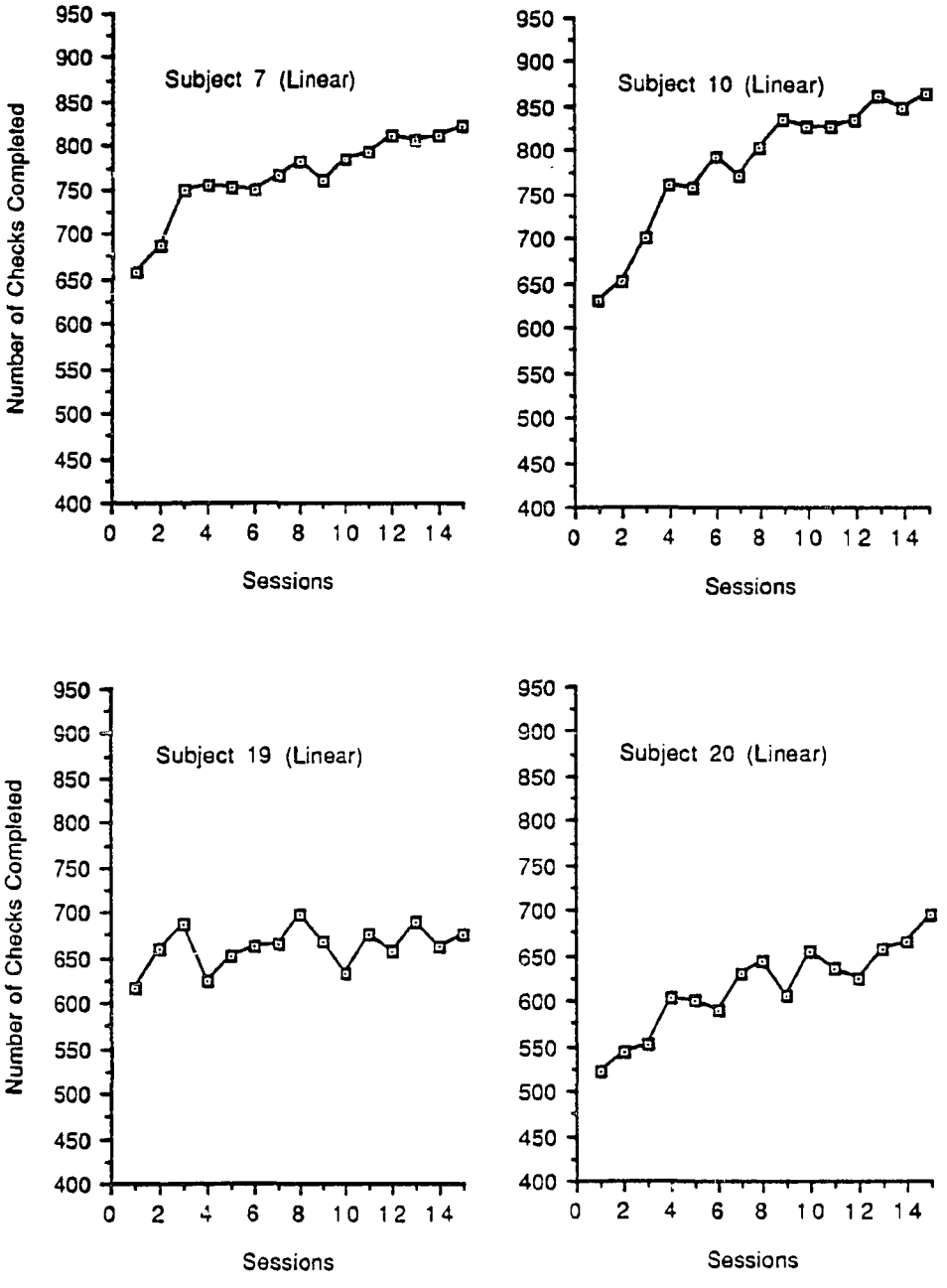


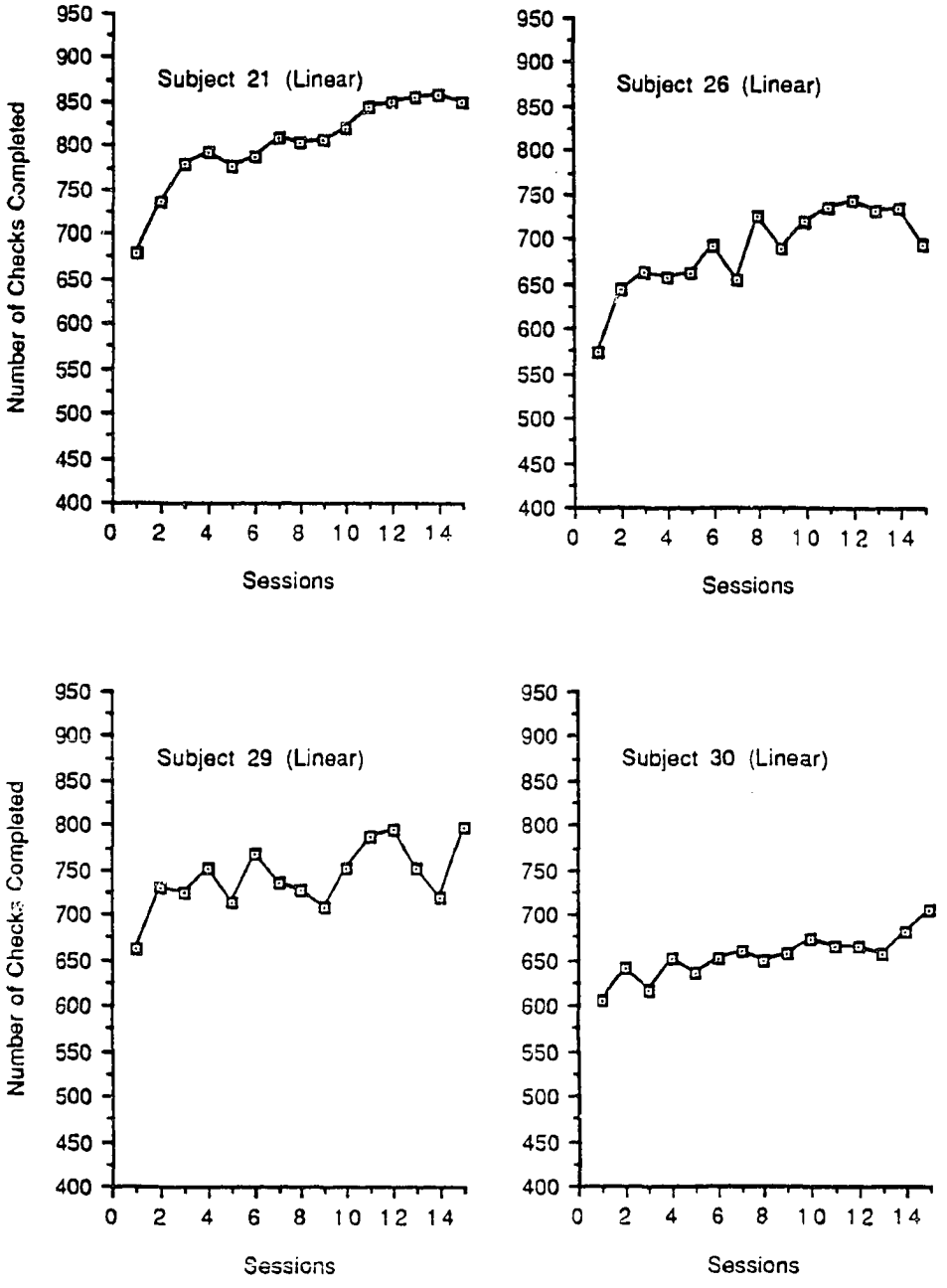


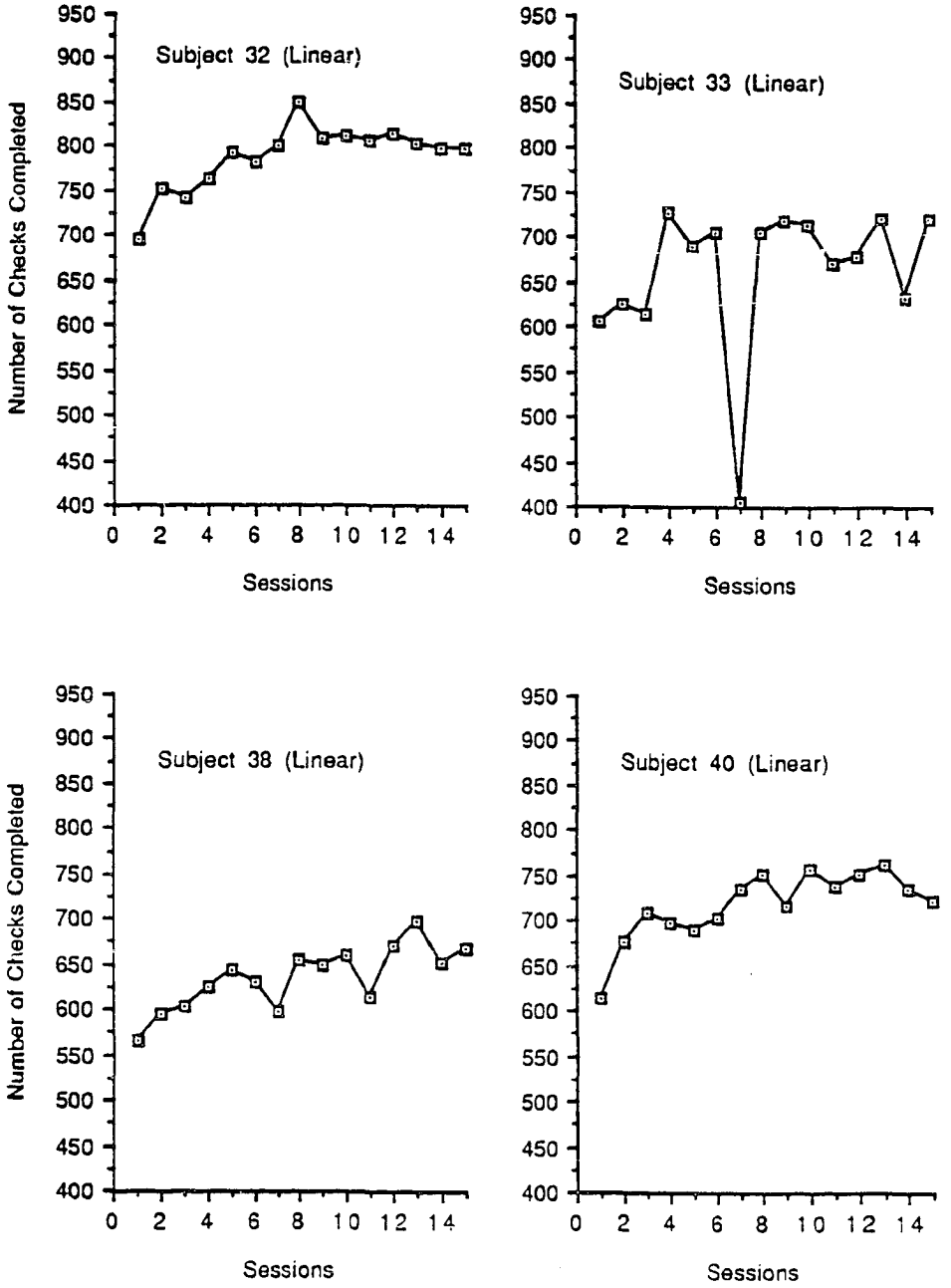


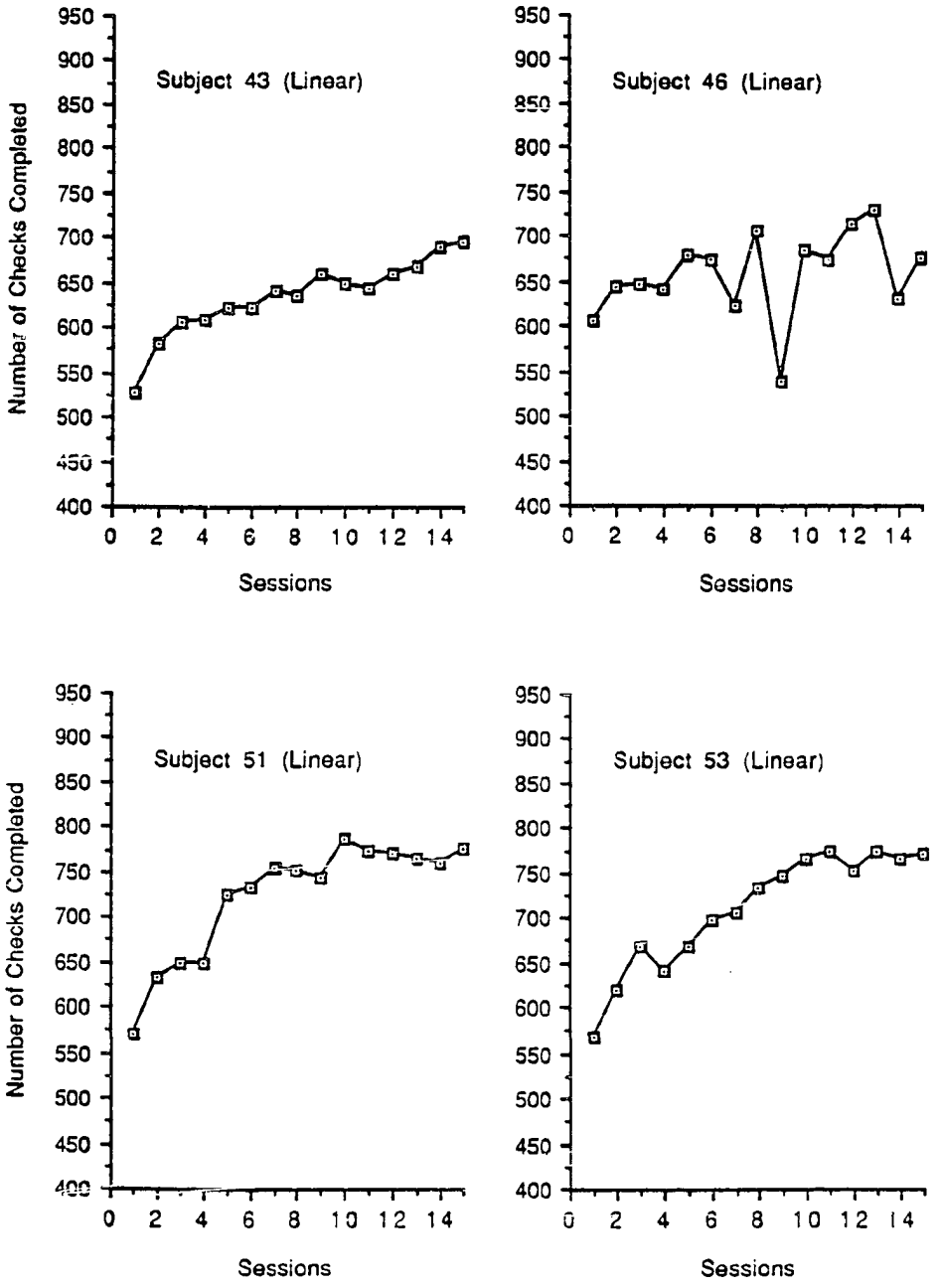


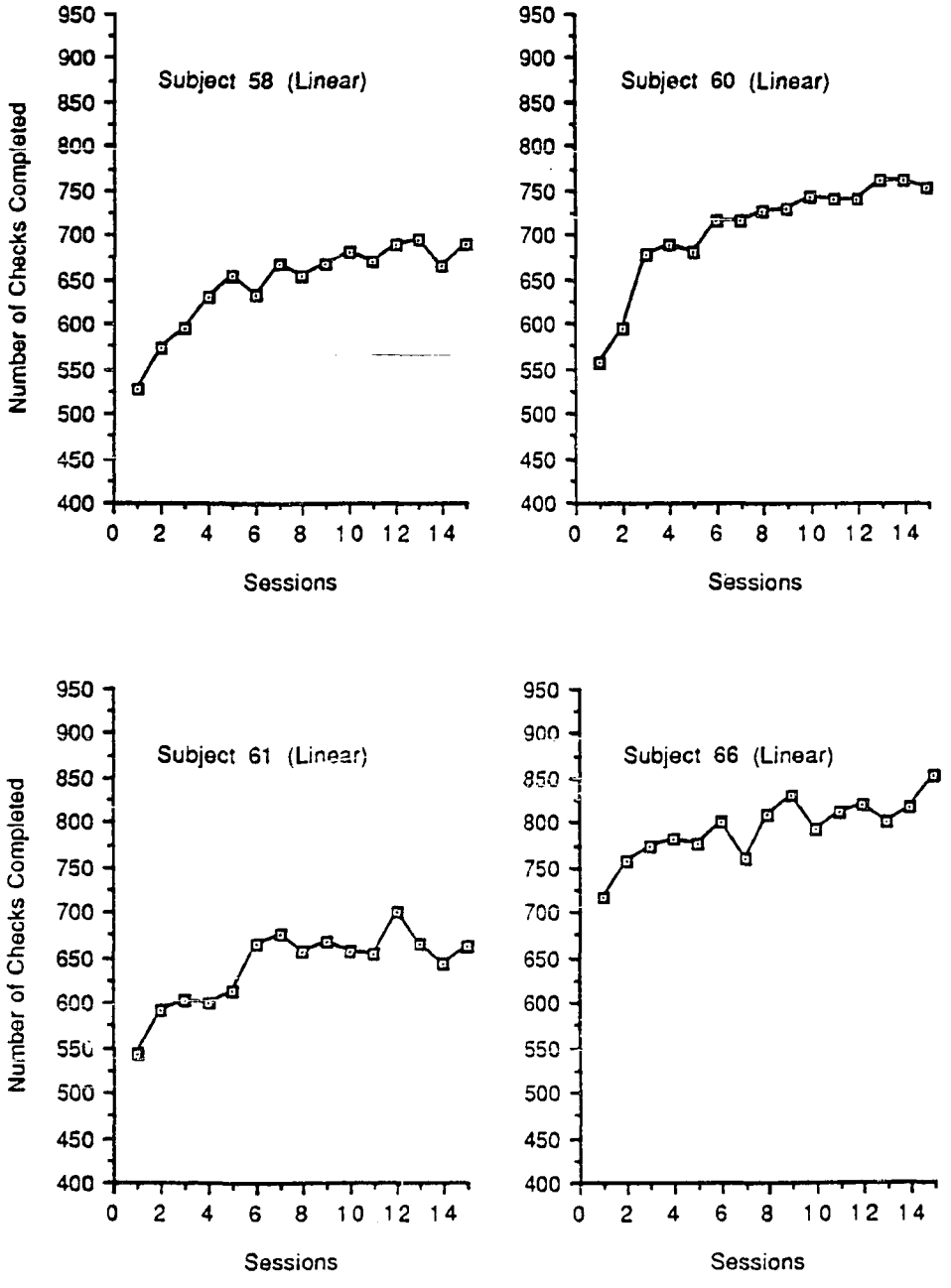












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